LAND REHABILITATION - POLICY AND PROCEDURES AT TWO HYDROELECTRIC DEVELOPMENTS IN NEWFOUNDLAND

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ABSTRACT

In 1975 Newfoundland and Labrador Hydro (Hydro), a provincial crown corporation, announced plans to develop the hydroelectric potential of the Upper Salmon and Cat Arm areas to meet a forecast provincial energy deficit in 1983. As part of Newfoundland's environmental assessment process baseline studies were carried out from 1975 to 1980 to evaluate the environmental acceptability of the proposed developments. The resulting Environmental Impact Statements for the respective developments were submitted by Hydro in 1980 to the Minister of Environment. Included in both impact statements was a commitment by Hydro to rehabilitate disturbed land areas.

Construction of both projects began in 1980 and was completed for the Upper Salmon and Cat Arm areas, in 1983 and 1984 respectively. Associated with the construction of these hydroelectric developments was a network of access roads, dams, dykes, borrow pits, rock quarries, spoil areas, waste disposal sites, campsites, marshalling areas and transmission lines. At both sites, rehabilitation is still ongoing by Hydro, in consultation with the Department of Environment.

The degree of disturbance and the problems associated with rehabilitation of these hydroelectric developments have been varied. The soils at Cat Arm are generally shallow, coarse-textured and nutrient-poor, reflecting the resistant nature of the bedrock underlying most of the area. These soils and the severe climate of the area impose restrictions on plant growth, and therefore on rehabilitation. The Upper Salmon area receives intensive use by caribou of the Grey River Herd (population 5000 animals). The area is used for calving and the post-calving aggregation and is a major migration route used during both spring and fall. This fact has influenced rehabilitation strategies.

Where reclamation has been undertaken the desired result has been prevention of erosion so that topsoil remains in place to promote a return of native species. Work has involved respreading of salvaged overburden and topsoil, grass-seeding and planting of native tree species.

At present the Environmental Assessment process plays an important role in land reclamation. Existing rehabilitation legislation is inadequate and government is in the process of drafting regulations to deal with this issue.

INTRODUCTION

In 1975 Newfoundland and Labrador Hydro (Hydro), a provincial crown corporation, announced plans to develop the hydroelectric potential of two major watersheds in insular Newfoundland, the West and North Salmon Rivers (Upper Salmon) located in south-central Newfoundland and the Cat Arm River on the upland plateau of the Great Northern Peninsula. At that time the Environmental Assessment process in Newfoundland was being developed and, in anticipation of forth coming regulatory requirements, the provincial government required Hydro to carry out comprehensive studies to evaluate the environmental acceptability of the proposed developments.

Environmental Impact Statements (EIS) were prepared for each proposed development and were submitted by Hydro to the Newfoundland Minister of Environment in 1980. Both impact statements included commitments by Hydro to rehabilitate disturbed land areas (Newfoundland and Labrador Hydro, 1980a;b).

The Upper Salmon area is used extensively by caribou during their annual migrations and is the site of the post-calving aggregation in mid-summer. In addition to extensive use at these times, small numbers of caribou can be found in the area during the rest of the year. A desire to protect this valuable resource played a large part in decisions to actively rehabilitate disturbed areas.

At the Cat Arm site caribou use is minimal. Still it was recognized that to protect remaining watersheds; (some of them prime Atlantic salmon habitat) and to encourage a return of other wildlife, areas prone to erosion would have to be rehabilitated.

At both sites a desire to restore and preserve the beauty of the natural landscape was also a factor in decisions to rehabilitate.

In the past, programs aimed at rehabilitating disturbed areas in Newfoundland have been few. Resource developments such as mining and hydroelectricity have proceeded with little thought given to the eventual reclamation of land exploited so that a single resource could be developed. Today, however, governments and industry are implementing procedures directed at ensuring that disturbed lands are reclaimed and allowed to regain varying degrees of productivity. Why should land impacted by the development of one resource be lost to all other potential uses?

Construction at both developments began in 1980. Associated with the construction of these hydroelectric developments, both located in remote relatively undisturbed areas, was an extensive network of access roads, dams and dykes, borrow pits, rock quarries, spoil areas, waste disposal sites, construction camps and transmission lines. Damming of the two rivers resulted in the flooding of a total of 8000 ha of shoreline. This loss of land is accepted by most as being an unavoidable cost of producing hydroelectric power. Many disturbed areas outside the flood zone

were to undergo rehabilitation.

OBJECTIVES AND CONSTRAINTS

The primary objective of rehabilitation was to control erosion so that organics and topsoil would remain in place to promote a return of native flora. Experiences at other resource developments had demonstrated that in the absence of a vegetative cover serious and expensive erosion problems were often the result (Newfoundland and Labrador Hydro, 1984). Uncontrolled, this erosion precludes other resource use on that land, threatens adjacent habitats and creates aesthetically unacceptable conditions.

The preservation of organics and topsoils for future respreading was a condition required of Hydro prior to Government approving either project. Individual construction permits such as stream crossing approvals and quarry/borrow area permits contained conditions binding contractors to practices that would help ensure successful reclamation. These regulated procedures combined with Hydro's own commitments in the EIS, have resulted in the province's first major resource developments where eventual reclamation has been a planning and procedural objective. We are still assessing the success of these efforts. Reclamation work is continuing in 1986 at both sites.

The soils of Newfoundland are generally acidic, often very shallow and frequently of low nutrient content. These factors, combined with a relatively short growing season can have a major impact on the potential for rapid natural revegetation. Soils subjected to grubbing, stripping and long-term stockpiling with resultant nutrient leaching are of diminished fertility when respread. In addition, there is often a direct loss of material due to erosion. These factors combined with often inadequate salvage efforts have made the task of rehabilitation more difficult.

Simply respreading this material over resloped ground is one step toward reclamation. In areas where erosion was not an anticipated factor and therefore rapid revegetation not as essential rehabilitation has been limited to respreading of material. Other areas had no topsoil salvaged and sloping without the application of organics was carried out. This may be seen as a minimal effort but is certainly an improvement over past practices.

PROCEDURES

It was recognized that successful revegetation could only be carried out in most locations if soil quality deficiencies were addressed. At selected locations requiring rapid green-up soil treatment consisted of the application of agricultural limestone and fertilizer before grass and/or native trees were planted.

In areas where limestone was used to treat soils it was spread by hand at a rate of approximately 70 kg/100 m^2. This was followed by the application of various mixtures of dry chemical

fertilizers at a rate of approximately 56 kg/ha. Fertilizers with different ratios of nitrogen, phosphate, and potassium (N-P-K) were used depending on soil analysis. The idea was to promote rapid and lush growth of a grass seed mixture consisting of 55% creeping red fescue, 25% annual rye, 15% Kentucky blue and 5% white clover. Seed mixtures were used since we did not know how these individual grasses would respond in the harsh environment. Creeping red fescue is hardy, has lower nutrient demands and will germinate in relatively cool temperatures. Annual rye is easily established and stabilizes soil surfaces early in the growing season. The fibrous root system of Kentucky blue aids in soil stability and the white clover is a known nitrogen fixer (quoted from Newfoundland and Labrador Hydro, 1984).

Following grass seeding conducted to halt immediate erosion and to protect soils from drying out, a number of areas were planted with native tree seedlings. These were usually black spruce (*Picea mariana*). Some larch (*Larix laricina*) were also planted. Some large areas at the Upper Salmon development were not grass seeded before tree seedlings were planted.

Subsequent site inspections have shown that there is limited success with the spruce and larch. This is especially evident where grass was not planted first. It appears that the early introduction of spruce and larch into disturbed areas has questionable value. In natural systems these large trees occupy one stage in a community succession and it would appear that the intermediate steps of moss, sedge and shrub cover cannot be bypassed with any realistic chance at long term success. The system must, ideally, develop through stages before conditions are met that would allow survival of these large species.

Factors that may contribute to this limited success also include the lack of adequate shelter for newly tranplanted seedlings, the shock of transplanting, planting conditions on the day in question (i.e. hot dry weather could cause immediate mortality) and poor nutrient availability.

Even under ideal conditions we cannot assume that these disturbed areas will eventually evolve into the same plant community structures that existed prior to disturbance. It will be interesting and informative to monitor these sites during future years to determine what sort of communities develop. Hydro has proposed that audits be conducted to document the level of reclamation success. This will help to improve rehabilitation on future proposals and highlight any need for further action on the existing sites.

The feasibility of planting clumps of speckled alder (*Alnus rugosa*) and mountain alder (*Alnus crispa*) is being examined. It is hoped they will be able to rapidly invade recently exposed soils.

LEGISLATION

It is apparent to everyone involved in reclamation at the Upper Salmon and Cat Arm developments that the success of any such

program depends largely on steps that must be taken early in the process. The eventual rehabilitation of disturbed lands must be considered an important project component by resource developers and their contractors.

The Government of Newfoundland and Labrador is in the process of developing regulations that will require minimum rehabilitation efforts on any resource development. The regulations being developed will be implemented under the Environmental Assessment Act.

It is presently proposed that an advisory board be established consisting of government, industry, public and academic members. This Board would report to the Minister of Environment on matters concerning rehabilitation.

Government is also exploring the concept of a performance bond to be required of developers prior to project approval. This bond will be used to undertake rehabilitation work in cases where the developer has failed to do so. A rehabilitation certificate will be issued by the Minister of Environment when a proponent is released from any further rehabilitation work on a specific undertaking.

CONCLUSION

In my position as an Environmental Surveillance Officer at various construction sites I have clearly seen the need for enacted regulations concerning rehabilitation. But legislation is only one part of the process. Regulations will mean nothing if the dozer operator stripping an area of land has no concept of what is required after the resource has been exploited. It is not enough to legislate, we must also educate. I believe that proponents and governments must be responsible for ensuring that contractors are aware of proper procedures to be followed. If soil is lost it is lost forever. The regulations proposed will play a large part in promoting responsible use of our land but they will not work without cooperation based on understanding from the people actually operating the equipment.

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ISSN 0705-5927

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FOREWORD

The British Columbia Chapter of the Canadian Land Reclamation Association was formed in 1985 to provide a local public forum for the exchange of information and experience in land rehabilitation. Comprised of professionals from a wide range of backgrounds and interests, this organization pulled together quickly to host the 1986 Annual Meeting. The diverse membership in the B.C. Chapter was realized in a program that expanded the scope of the conference to include many fields that have not been represented in past programs. The quality of presentations and range of topics kept audience participation at a spirited level. It is our hope that we have initiated a trend to widen the scope of the annual meetings so as to not focus on traditional mining or energy development issues.

I wish to thank all speakers and attendees for making this first formal function of the B.C. Chapter a success. The enthusiastic support of chapter members in the planning and administration of the conference demonstrated a strong desire for a quality meeting. This drive bodes well for the future of our chapter.

A great deal of effort went into the publication of the proceedings of the 1986 Annual Meeting. Care was taken to accurately reproducce all papers, however minor errors may have escaped the review process. We hope that this will not detract from the information presented by the authors.

May the CLRA and all local chapters continue to grow and function as a focal point for land rehabilitation.